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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/595,188	03/21/2006	Yuji Hiroshige	59024US004	4228
32692 7590 12/09/2009 3M INNOVATIVE PROPERTIES COMPANY PO BOX 33427 ST. PAUL, MN 55133-3427				
EXAMINER				
RIOJA, MELISSA A				
ART UNIT		PAPER NUMBER		
1796				
NOTIFICATION DATE		DELIVERY MODE		
12/09/2009		ELECTRONIC		

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

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LegalDocketing@mmm.com

### Office Action Summary

**Application No.**

10/595,188

**Applicant(s)**

HIROSHIGE ET AL.

**Examiner**

MELISSA RIOJA

**Art Unit**

1796

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --  
**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 04 September 2009.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 11-20 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 11-20 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO/SI/200)
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date: \_\_\_\_\_
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: \_\_\_\_\_
- Paper No(s)/Mail Date 12/19/08, 8/10/09, 10/12/09

## DETAILED ACTION

### *Claim Rejections - 35 USC § 112*

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

**Claims 11 – 20** are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Claim 11 sets forth a heat conductive foam sheet "wherein the heat polymerization and foaming reactions of the (meth)acrylic monomer or its partial polymer occurs in the same heating step." It is unclear how this process limitation further limits the claims which are directed to a product.

### *Claim Rejections - 35 USC § 103*

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

**Claims 11 - 20** are rejected under 35 U.S.C. 103(a) as being unpatentable over US 2004/0241417 to Fischer et al. in view of US 6,841,612 to Yang et al.

**Regarding Claims 11 and 13.** Fischer et al. teach a foam thermal interface material which may be prepared in the form of a sheet. The foam material comprises a thermally/heat conductive filler and a hot melt pressure sensitive adhesive (PSA) (Paragraph 31). The PSA may include polymers formed by polymerizing one or more acrylic or methacrylic esters of alkyl alcohols with alkyl groups of 1 to 20 carbon atoms. Suitable acrylate monomers include 2-ethylhexyl acrylate (Paragraph 39). A foaming agent is also used to prepare the foam (Paragraphs 50 - 55).

Fischer et al. teaches the PSA may contain free radical initiators (Paragraph 38) but do not expressly teach they are heat polymerization initiators. However, Yang et al. also teach acrylic polymers prepared using free-radical initiators, specifically peroxy and hydroperoxy initiators. Examples of such initiators include benzoyl peroxide and lauroyl peroxide (Column 4, Line 63 - Column 5, Line 11), both of which are indicated in the instant specification on page 7 to be useful as heat polymerization initiators. Fischer et al. and Yang et al. are analogous art as they are from the same field of endeavor, namely acrylic polymer compositions. At the time of invention, it would have been obvious to a person of ordinary skill in the art to use a peroxy initiator in the PSA taught by Fischer et al. The motivation would have been that presence of peroxide

initiators would initiate the thermal polymerization of acrylates, supplementing the UV polymerization originally taught by Fischer et al. The thermal polymerization of acrylates is less costly and requires less process modification than UV polymerization.

While Fischer et al. do not expressly teach the heat and foaming reactions occur in the same step, this process limitation does not further limit the claim, as indicated in the rejection under 35 U.S.C. 112 above.

**Regarding Claim 12.** Fischer et al. teach the foam sheet of Claim 11 wherein the PSA has a number average molecular weight of greater than 25,000 and particularly greater than 100,000 (Paragraph 33).

Fischer et al. do not expressly teach a crosslinking agent is included in the heat-polymerizable binder component. However, Yang et al. also teach acrylic polymers compositions in which crosslinking monomers may be included (Column 4, Lines 50 – 65). At the time of invention, it would have been obvious to a person of ordinary skill in the art to include a crosslinking agent in the binder/PSA taught by Fischer et al. The motivation would have been that the addition of a crosslinking agent would increase the mechanical strength of the foam sheet produced from the PSA taught by Fischer et al.

Fischer et al. are silent regarding the shearing storage modulus of foam sheet. Consequently, the Office recognizes that all of the claimed effects or physical properties

are not positively stated by the reference(s). However, the reference(s) teaches all of the claimed ingredient(s). Therefore, the claimed effects and physical properties - i.e. a foam sheet with a shearing storage modulus of  $1.0 \times 10^3$  to  $1.0 \times 10^5$  at the frequency of 1 Hz and  $20^\circ\text{C}$  - would implicitly be achieved by a composition with all the claimed ingredients. If it is the applicant's position that this would not be the case: (1) evidence would need to be provided to support the applicant's position; and (2) it would be the Office's position that the application contains inadequate disclosure that there is no teaching as to how to obtain the claimed properties with only the claimed ingredients.

**Regarding Claim 14.** Fischer et al. teach the foam sheet of Claim 11 wherein the PSA has a number average molecular weight of greater than 25,000 and particularly greater than 100,000 (Paragraph 33). The PSA may further comprise polymers with glass transition temperatures less than the glass transition temperature of the acrylate homopolymer. These polymers are prepared from the copolymerization of acrylate monomers and a comonomer such as ethoxyethoxy ethyl acrylate. Ethoxyethoxy ethyl acrylate has a glass transition temperature ( $T_g$ ) of  $-71^\circ\text{C}$  (Paragraph 40). At the time of invention, it would have been obvious to a person of ordinary skill in the art to include a polymer with a glass transition temperature less than the glass transition temperature of the acrylate homopolymer in the PSA taught by Fischer et al. The motivation would

have been that polymers with low glass transition temperatures exhibit adhesiveness at elevated temperatures.

**Regarding Claim 15.** Fischer et al. teach the foam sheet of Claim 11 wherein the foaming agent may be in the form of polymeric microspheres with polymeric shells that expand upon heating (Paragraph 54), i.e. thermal expanding microcapsules.

**Regarding Claim 16.** Fischer et al. teach the foam sheet of Claim 11. When polymeric microspheres are used as the foaming agent, they are used in an amount of 0.1 to 10 parts by weight based upon 100 parts polymer resin (Paragraph 55).

**Regarding Claim 17.** Fischer et al. teach the foam sheet of Claim 11 has a thermal conductivity of atleast about 0.5 Watts/meter-K (Paragraph 32) but does not expressly teach it to have a thermal conductivity of 2 or more Watts/meter-K. Consequently, the Office recognizes that all of the claimed effects or physical properties are not positively stated by the reference(s). However, the reference(s) teaches all of the claimed ingredient(s). Therefore, the claimed effects and physical properties - i.e. a thermal conductivity of 2 or more Watts/meter-K - would implicitly be achieved by a composition with all the claimed ingredients. If it is the applicant's position that this would not be the case: (1) evidence would need to be provided to support the applicant's position; and (2) it would be the Office's position that the application

contains inadequate disclosure that there is no teaching as to how to obtain the claimed properties with only the claimed ingredients.

**Regarding Claim 18.** Fischer et al. teach the foam sheet of Claim 11 wherein the void volume is atleast 5% of the volume of the foamed product (Paragraph 55). Generally, the foam contains less than 75, 60, or 50 percent void volume (Paragraph 56).

**Regarding Claims 19 and 20.** Fischer et al. teach a material in which the foam sheet of Claim 11 joins processors and components to heat-dissipating devices, such as heat sinks or spreaders (Paragraph 85).

### ***Response to Arguments***

Applicant's arguments filed September 4, 2009 have been fully considered but they are not persuasive because:

Applicant argues that the heat polymerization initiators taught by Yang et al. would not be suitable in the hot melt PSA of Fischer et al. Applicant indicates that the hot melt PSA system of Fischer et al. is designed for a photoinitiator. The Office recognizes that polymerization is initiated by ultraviolet radiation in the examples disclosed by Fischer et al. However, an invention is not bound by the examples provided. Fischer et al. also allude to the ability of their PSA to undergo alternative



forms of polymerization, indicating polymers of the PSA may be prepared from non-photopolymerizable monomers (Paragraph 41).

Furthermore, the fact that a system may be polymerized by ultraviolet radiation does not preclude it from undergoing heat-initiated polymerization. In applicant's own specification, the (meth)acrylic monomers may undergo either heat or photopolymerization (Paragraphs 41 and 42). For these reasons, it is the Office's position that there is a reasonable expectation of success when heat polymerization initiators are used as the free radical initiators in the hot melt PSA of Fischer et al.

### *Correspondence*

Any inquiry concerning this communication or earlier communications from the examiner should be directed to MELISSA RIOJA whose telephone number is (571)270-3305. The examiner can normally be reached on Monday - Friday 7:00AM - 3:30PM E.S.T..

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mark Eashoo can be reached on (571)272-1197. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Mark Eashoo/  
Supervisory Patent Examiner, Art Unit 1796

/MR/  
December 4, 2009